YAKEEN NEET 2.0

2026

Electric Charges and Fields

Physics | Assignment Solution 01

By- Manish Raj (MR Sir)

QUESTION

Match the facts given in Column I with the Column II:

	Column-I		Column-II
I.	Charge cannot exist	a.	Without charge
II.	Mass can exist (new)	b.	Without mass
III.	Charge is	c.	Not conserved
IV.	Mass is	d.	conserved

1. I-b, II-a, III-d, IV-c
2. I-b, II-a, III-c, IV-d
3. I-b, II-d, III-a, IV-c
4. I-b, II-c, III-d, IV-a

QUESTION

If a body is charged by rubbing it with another body then $\boxed{\text{weight of the system:}}$

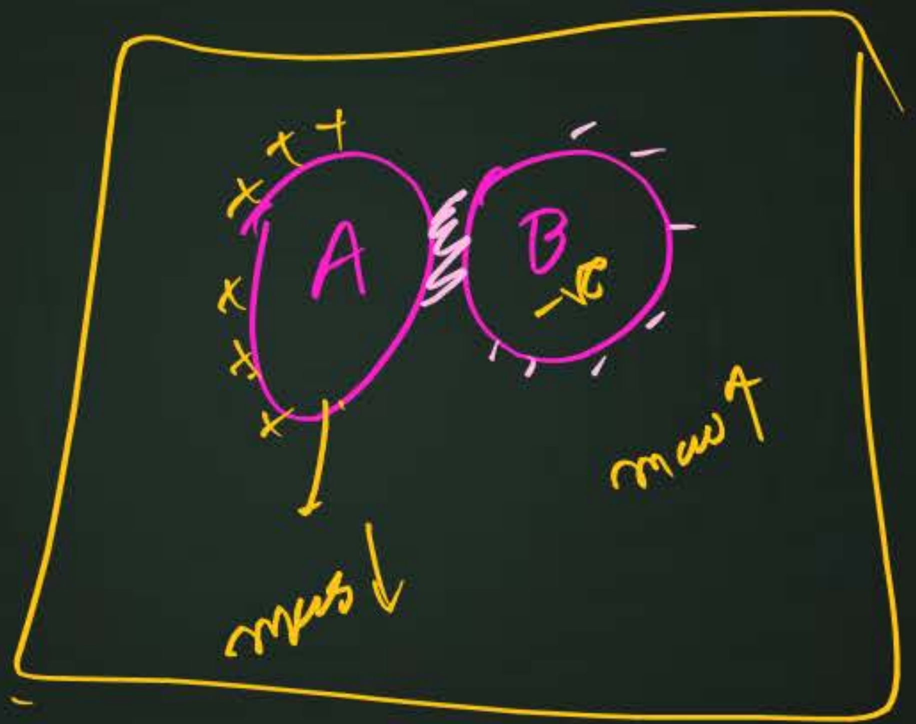
(A) may increase slightly

(B) may decrease slightly

(C) must increase slightly

(D) remains precisely constant

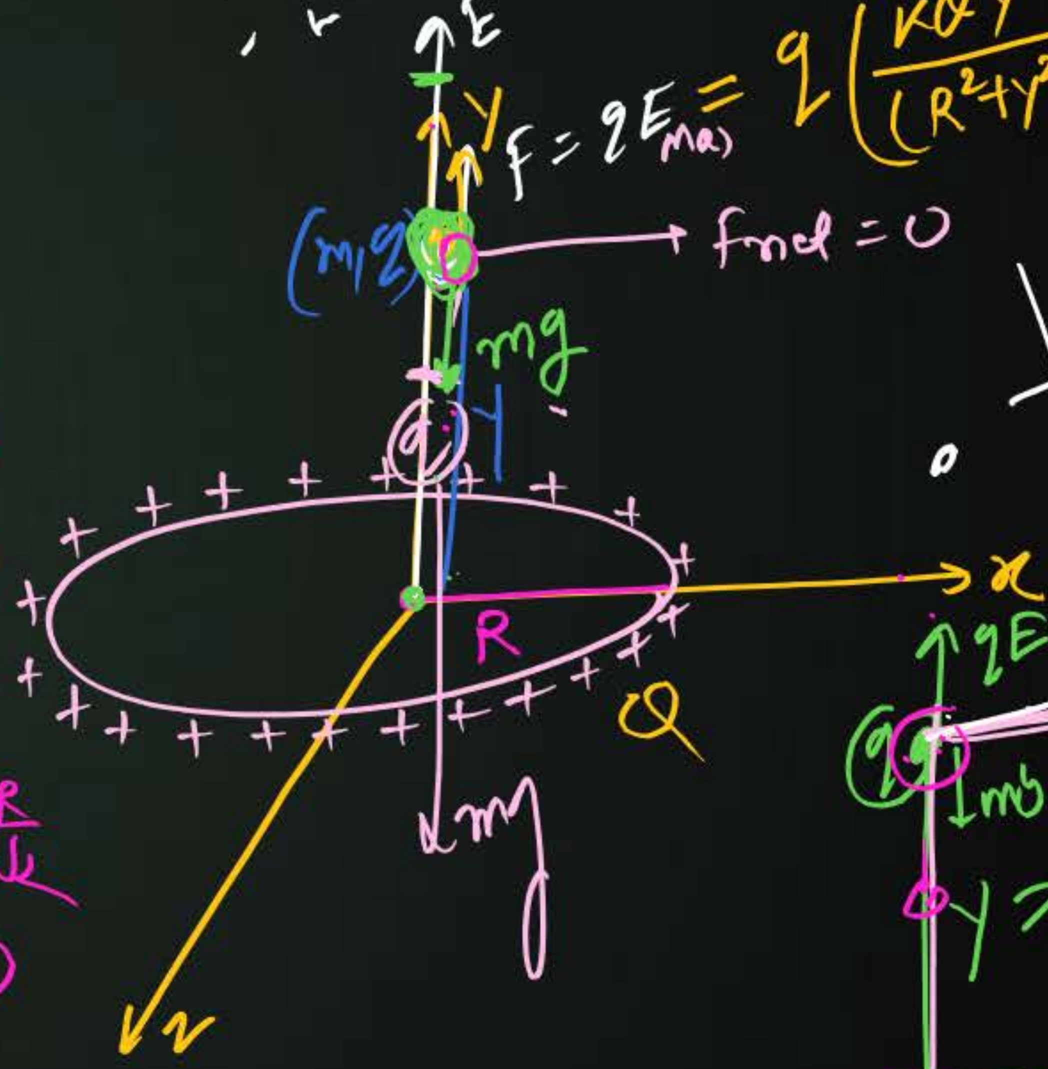
1. Only A
2. AB
3. D
4. C



QUESTION

$$E = \frac{KQx}{(R^2+x^2)^{3/2}}$$

A uniformly charged ring is placed in x-z plane as shown in figure. A point charge $+q$ is placed on y-axis and it is in equilibrium. Choose the correct statement.



$$F = qE_{max} = q\left(\frac{KQy}{(R^2+y^2)^{3/2}}\right)$$

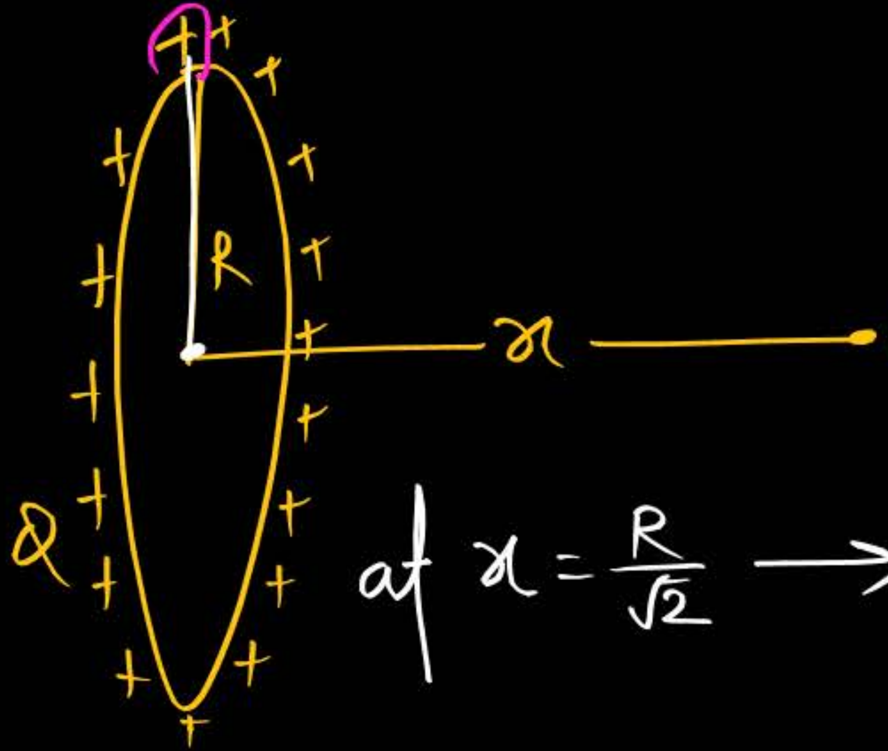
(1) If $y = \frac{R}{\sqrt{2}}$, nature of equilibrium is stable

(2) If $y > \frac{R}{\sqrt{2}}$, nature of equilibrium is unstable

(3) If $y < \frac{R}{\sqrt{2}}$, nature of equilibrium is unstable

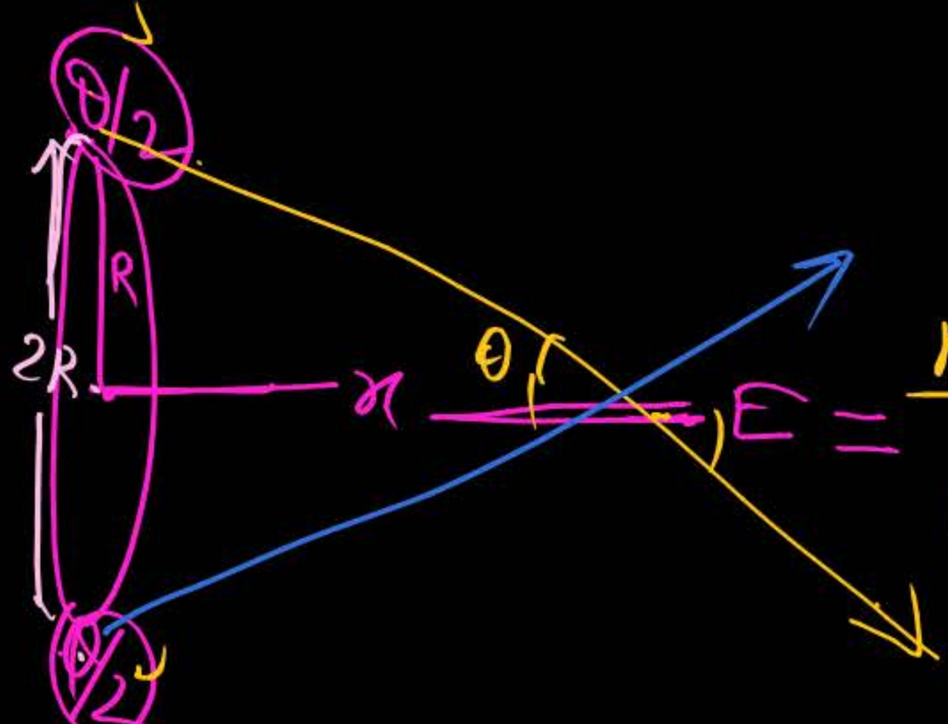
(4) If $y = \frac{R}{\sqrt{2}}$, is the position where electric force experienced by $+q$ is minimum

Ring symmetry

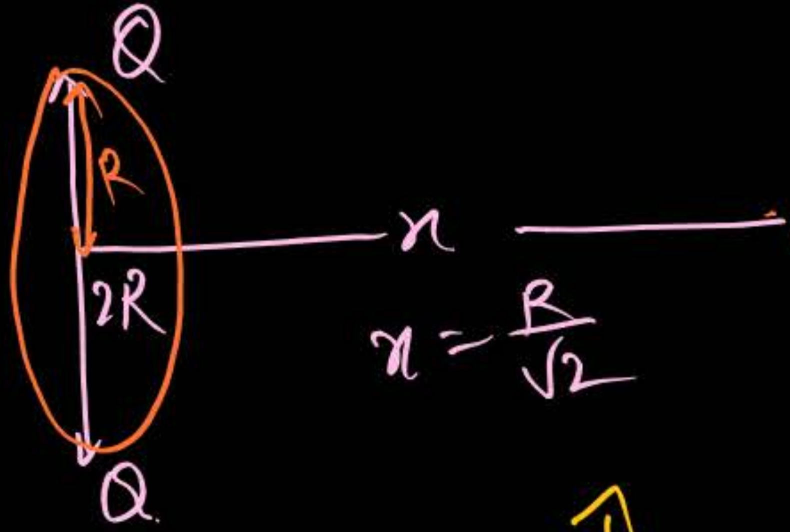


$E = \frac{KQx}{(R^2+x^2)^{3/2}}$

at $x = \frac{R}{\sqrt{2}} \longrightarrow E_{max}$

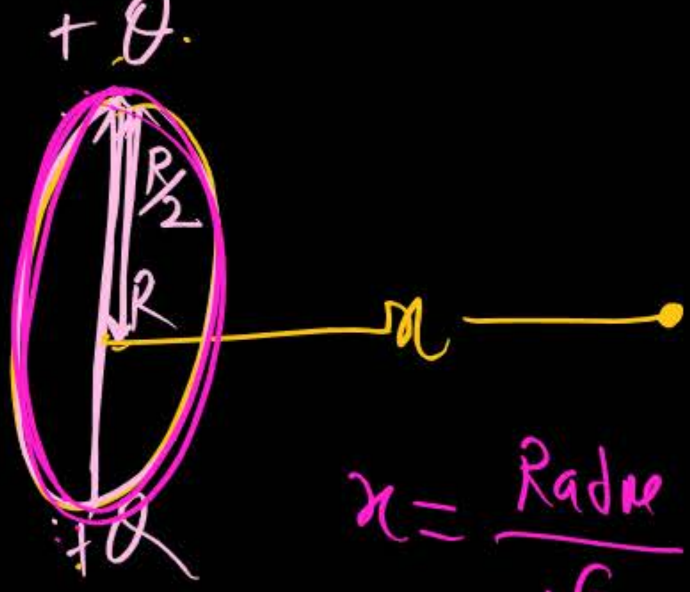


$E = \frac{KQx}{(R^2+x^2)^{3/2}}$.



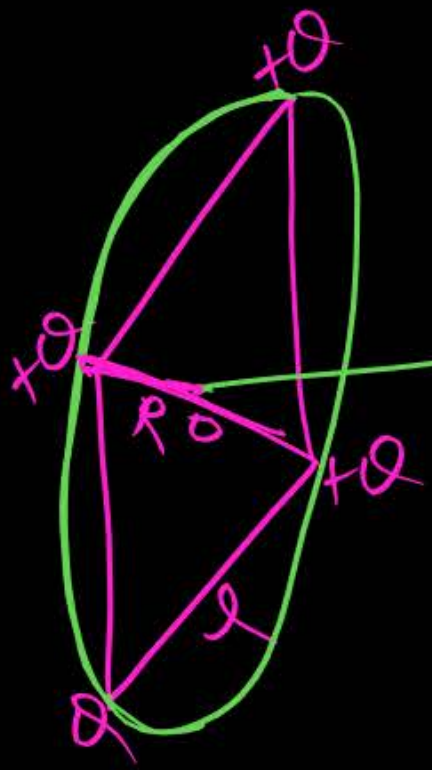
$E = \frac{K2Qx}{(R^2+x^2)^{3/2}}$

$x = \frac{R}{\sqrt{2}}$



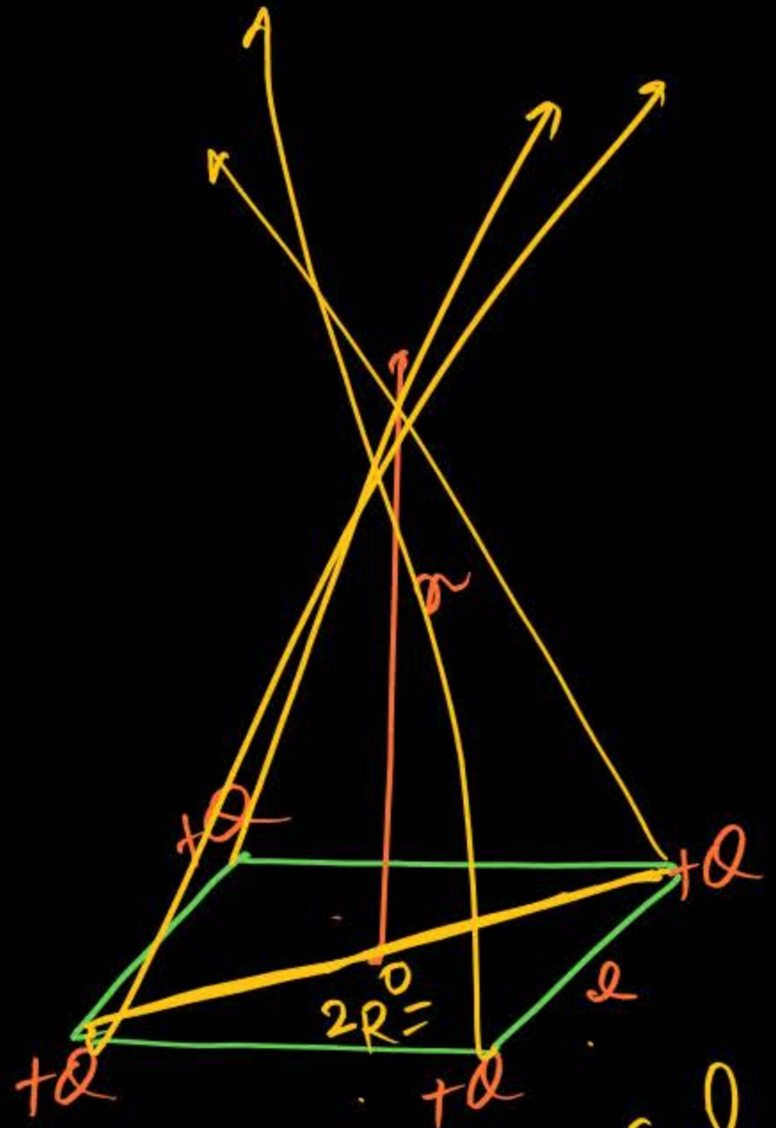
$E = \frac{K2Qx}{\left(\left(\frac{R}{2}\right)^2+x^2\right)^{3/2}}$

$x = \frac{Radu}{\sqrt{2}} = \frac{R}{2\sqrt{2}}$



$$\longrightarrow E = \frac{K4Qx}{(R^2+x^2)^{3/2}}$$

$$= \frac{K4Qx}{\left(\left(\frac{l}{\sqrt{2}}\right)^2 + x^2\right)^{3/2}}$$



$2R = \sqrt{2}\,l$

$$\boxed{R = \frac{\sqrt{2}\,l}{2} = \frac{l}{\sqrt{2}}}$$

E will be max at $x = \frac{\text{Radius}}{\sqrt{2}} = \frac{l}{\sqrt{2}\times\sqrt{2}}$

$$\boxed{x = \frac{l}{2}}$$

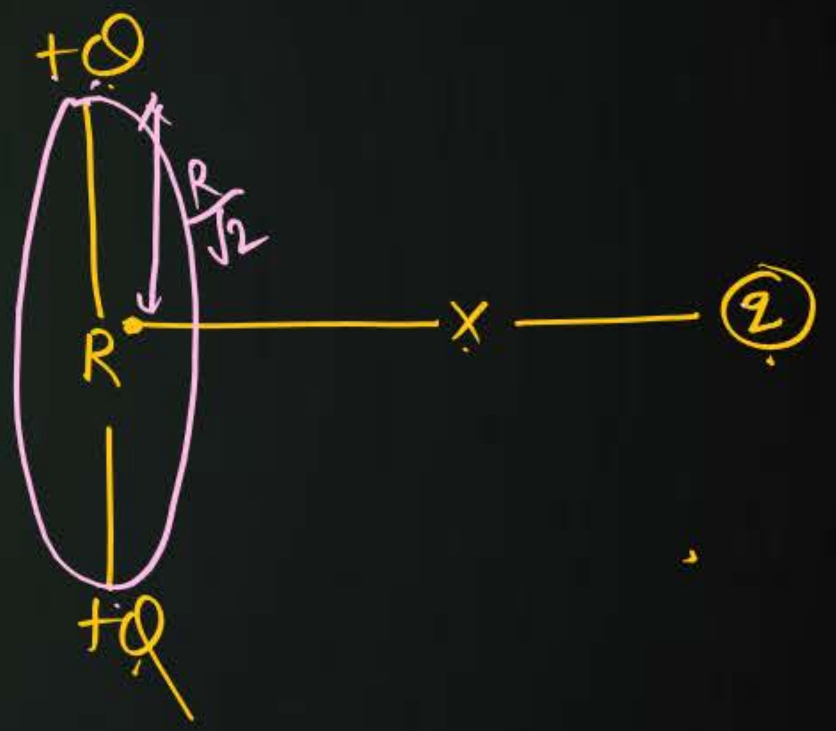
QUESTION

Two equal point charges A and B are R distance apart. A third point charge placed on the perpendicular bisector at a distance 'x' from the centre the experience maximum electrostatic force when:

1. $x = \dfrac{R}{2\sqrt{2}}$
2. $x = \dfrac{R}{\sqrt{2}}$
3. $x = R\sqrt{2}$
4. $x = 2\sqrt{2}R$

$= \dfrac{\text{Radius}}{\sqrt{2}}$

$= \dfrac{R}{2\sqrt{2}}$



QUESTION

Find magnitude of net electric force on charge Q placed on X-axis:

1. $\dfrac{\sqrt{2}Q^2}{8\pi \epsilon_0 R^2}$

2. $\dfrac{\sqrt{2}Q^2}{4\pi \epsilon_0 R^2}$

3. $\dfrac{\sqrt{2}Q^2}{8\pi \epsilon_0 R}$

4. $\dfrac{2\sqrt{2}Q^2}{8\pi \epsilon_0 R^2}$

$F = QE$

$= Q\left(\dfrac{KQR}{(R^2+R^2)^{3/2}}\right)$

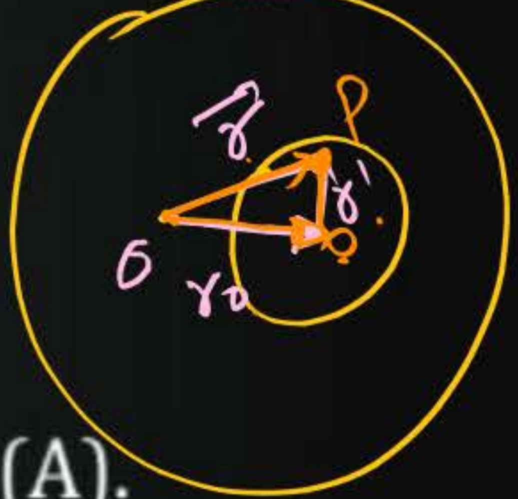
✓

QUESTION

$E_{in} = \frac{\rho \vec{r}}{3\varepsilon_0}$

Assertion (A): If a spherical cavity is made inside a uniformly charged sphere, then electric field inside the cavity is uniform.

Reason (R): The electric field inside the cavity is independent of radius of cavity, but depends on radius of sphere.

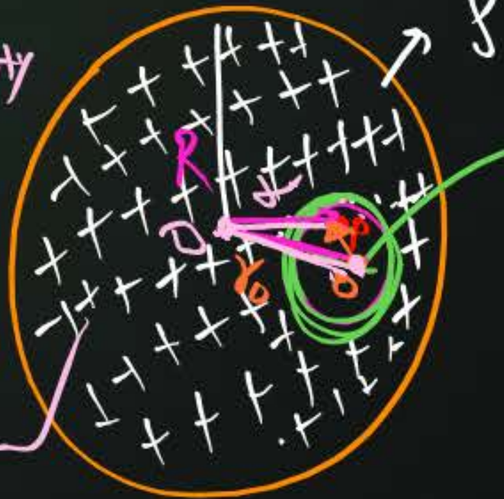


1. Both (A) and (R) are true and (R) is the correct explanation of (A).
2. Both (A) and (R) are true and (R) is NOT the correct explanation of (A).
3. (A) is true but (R) is false.
4. (A) is false but (R) is true.

$(E_P)_{net} = E_{comp} - E_{cavity}$

$= \frac{\rho \vec{r}}{3\varepsilon_0} - \frac{\rho \vec{r'}}{3\varepsilon_0}$

$= \frac{\rho}{3\varepsilon_0}\left(\vec{r} - \vec{r'}\right) = \frac{\rho \vec{r_0}}{3\varepsilon_0}$



Uniform

$\vec{r_0} + \vec{r'} = \vec{r}$

$\boxed{\vec{r_0} = \vec{r} - \vec{r'}}$

QUESTION

A thin ring of radius 'r' made up of a conducting material having charge 'q'. Find the increase in the tension the ring if a point charge Q is placed at centre of ring:

$2\pi r \longrightarrow q$

$1 \longrightarrow \frac{q}{2\pi r}$

$r2\theta \longrightarrow \frac{q}{2\pi r} r 2\theta$

Force B/w Ring & +Q

charge at centre = zero

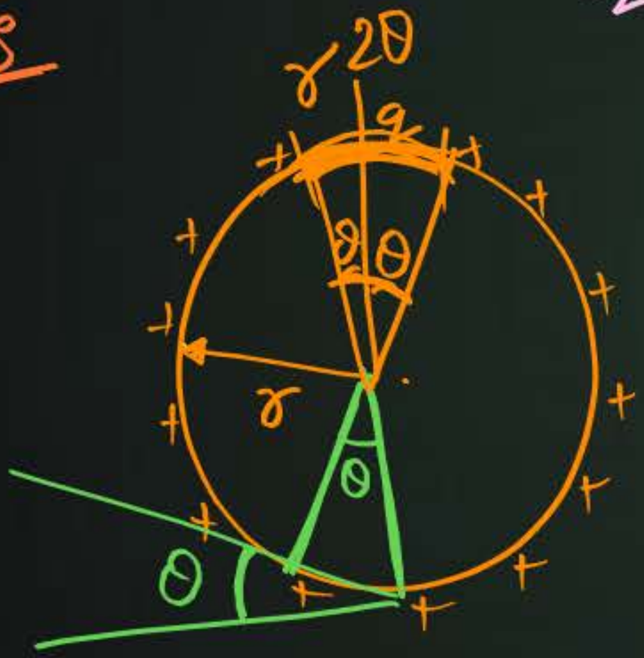
(1) $\frac{Qq}{8\pi^2\varepsilon_0 r^2}$ ✓ Ans

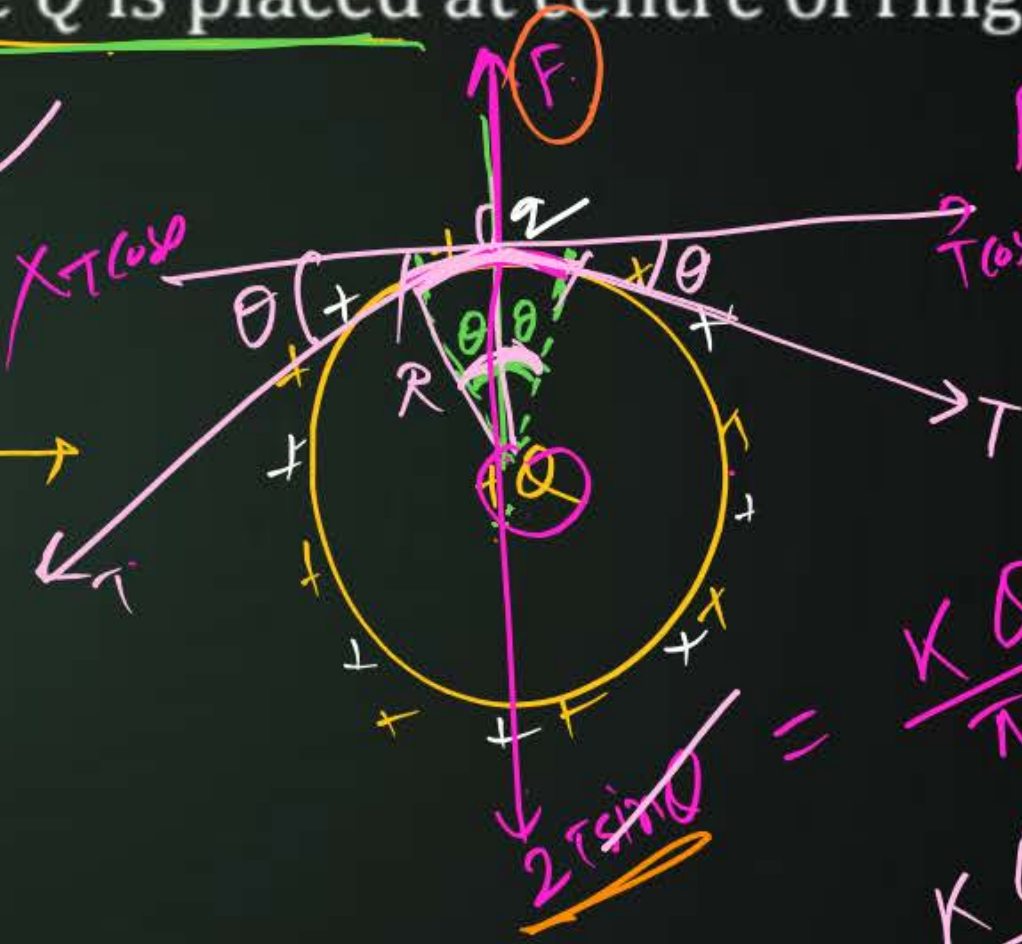
(2) $\frac{Qq}{4\pi r^2 \varepsilon}$

(3) $\frac{Qq}{8\pi r^2 \varepsilon_0}$

(4) $\frac{Qq}{16\pi^2 r^2 \varepsilon_0}$

$dq = \frac{q\theta}{\pi}$





$F_e = \frac{KQq\theta}{\pi r^2}$ — (1)

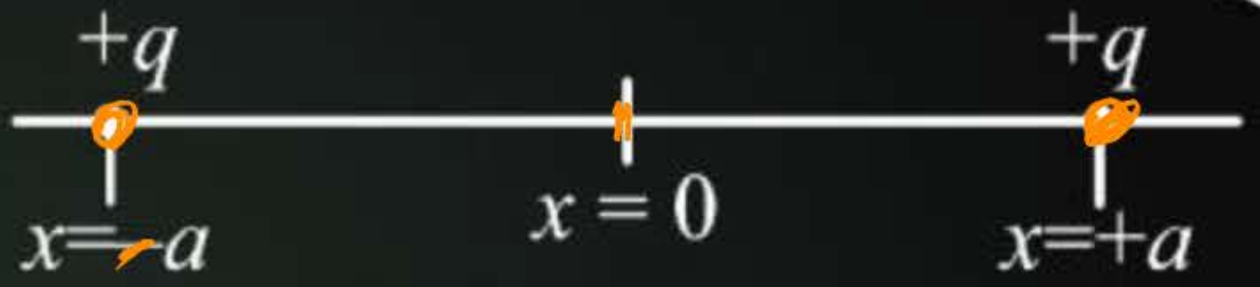
$2T\sin\theta = \frac{KQq\theta}{\pi r^2}$

$T = \frac{KQq}{2\pi r^2}$

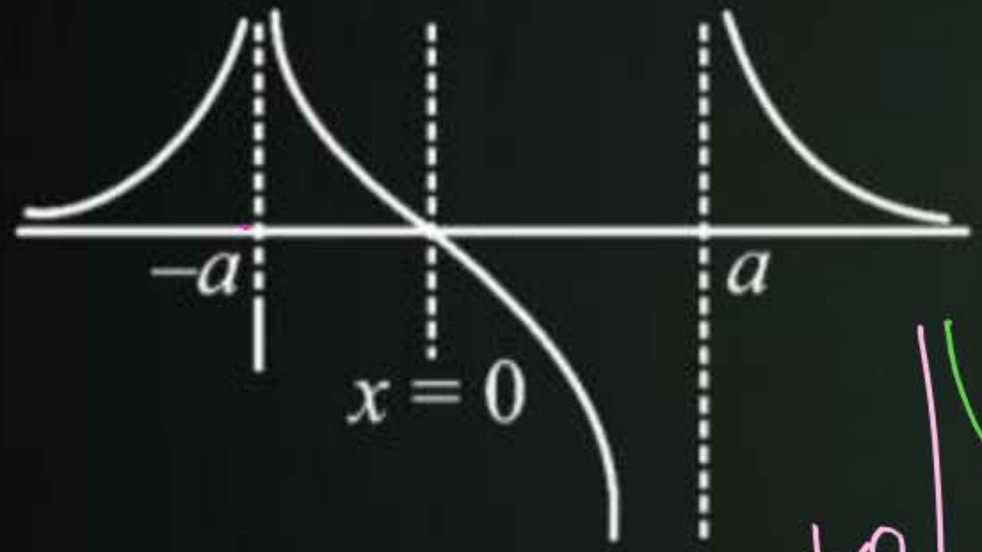
$\therefore T = \frac{Qq}{4\pi\varepsilon_0 \times 2\pi r^2}$

QUESTION

Consider the charge configuration shown in the figure. Variation of electric field along x-axis is



1



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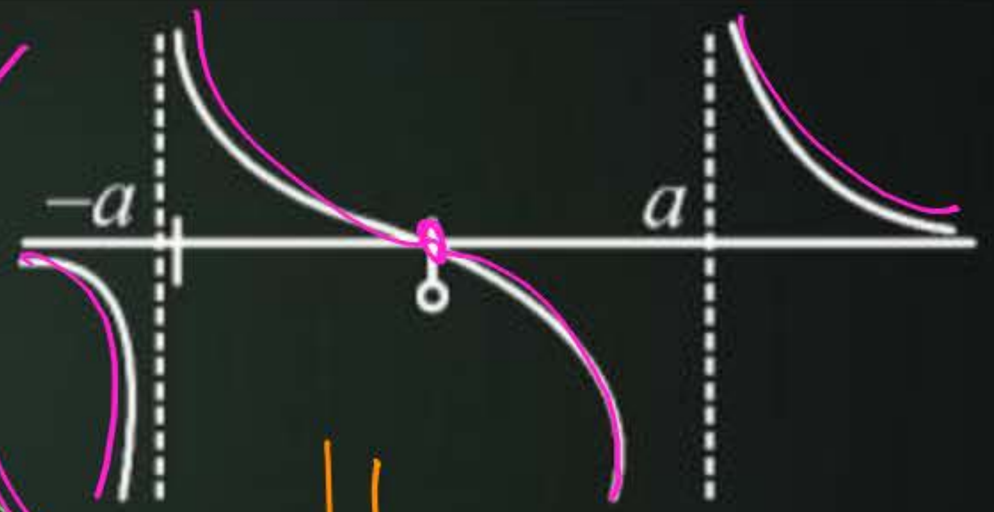

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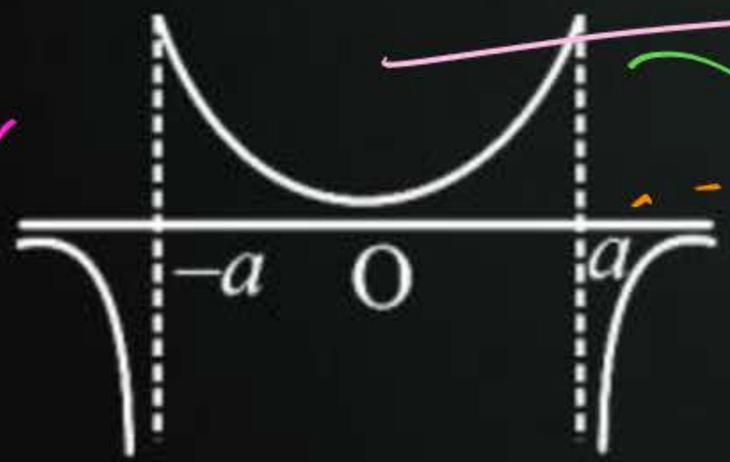
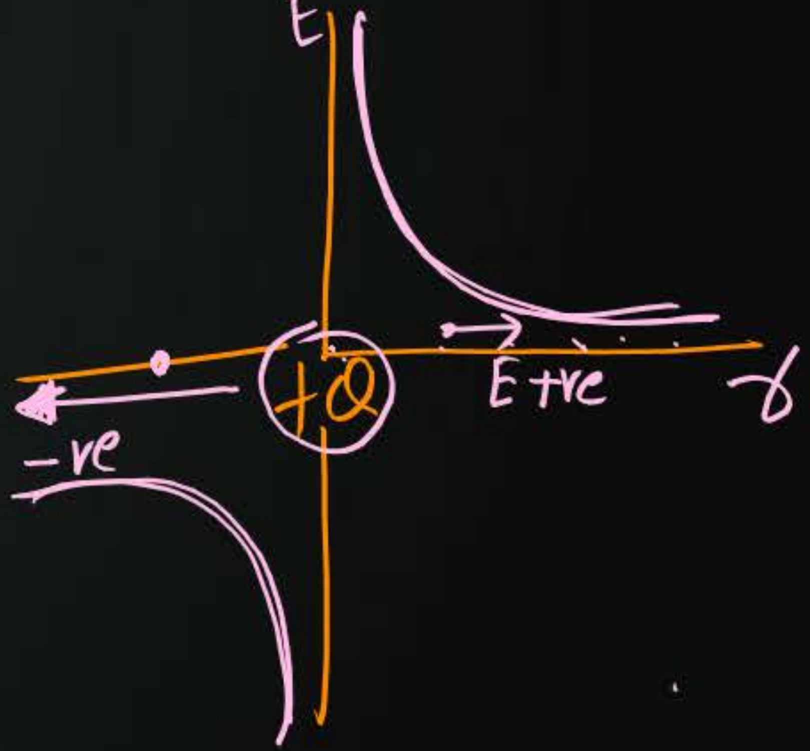
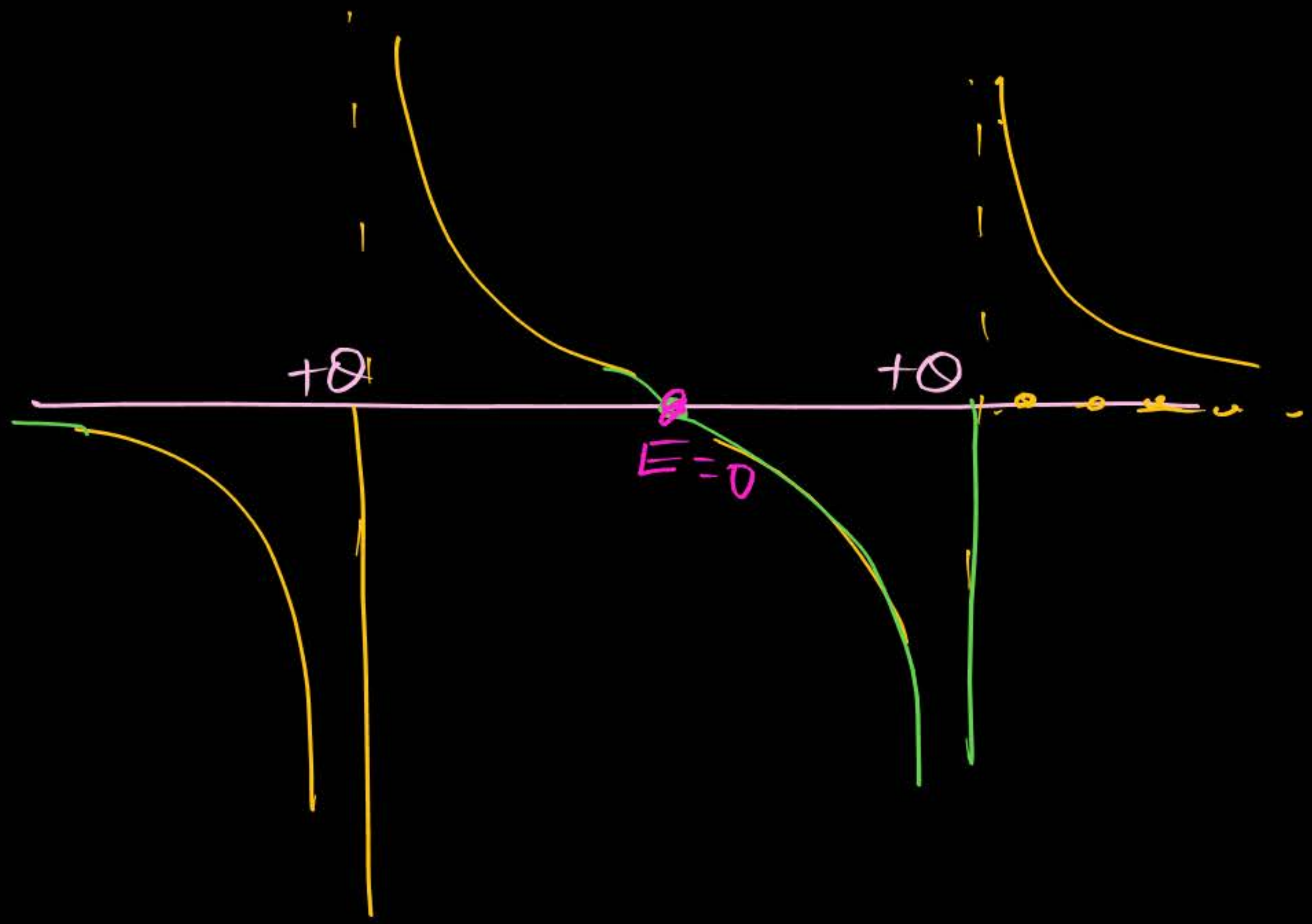
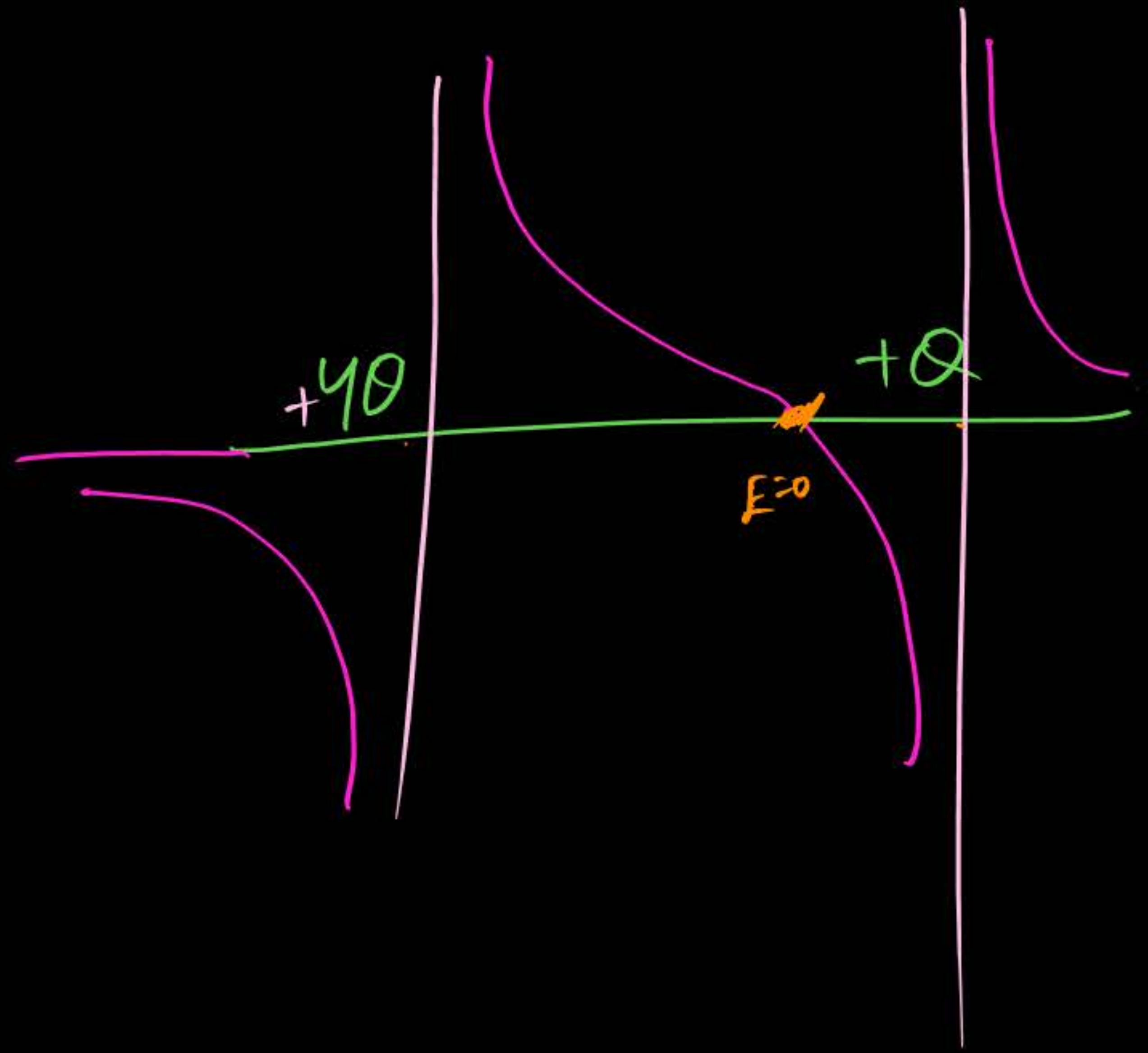


4 None of these

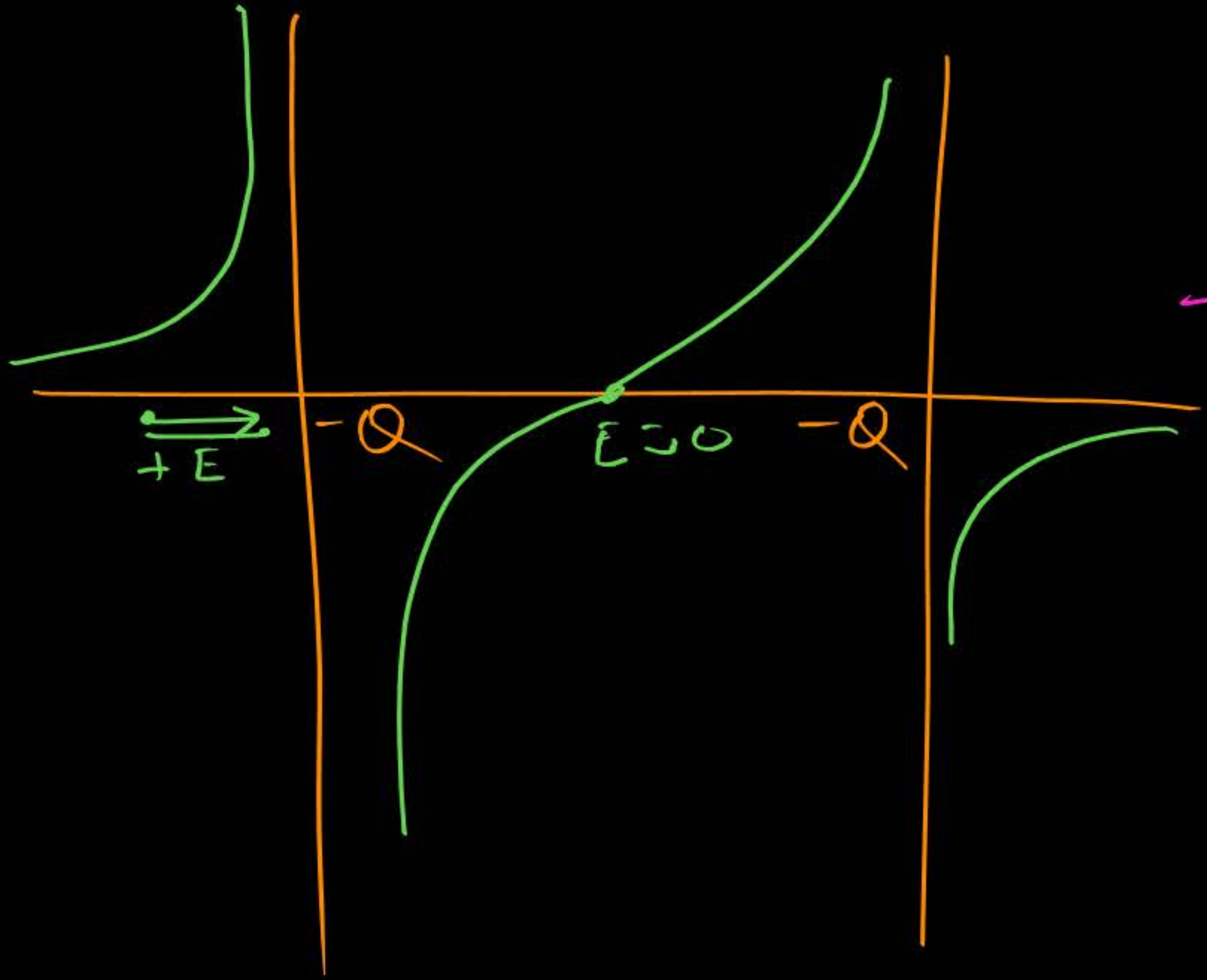


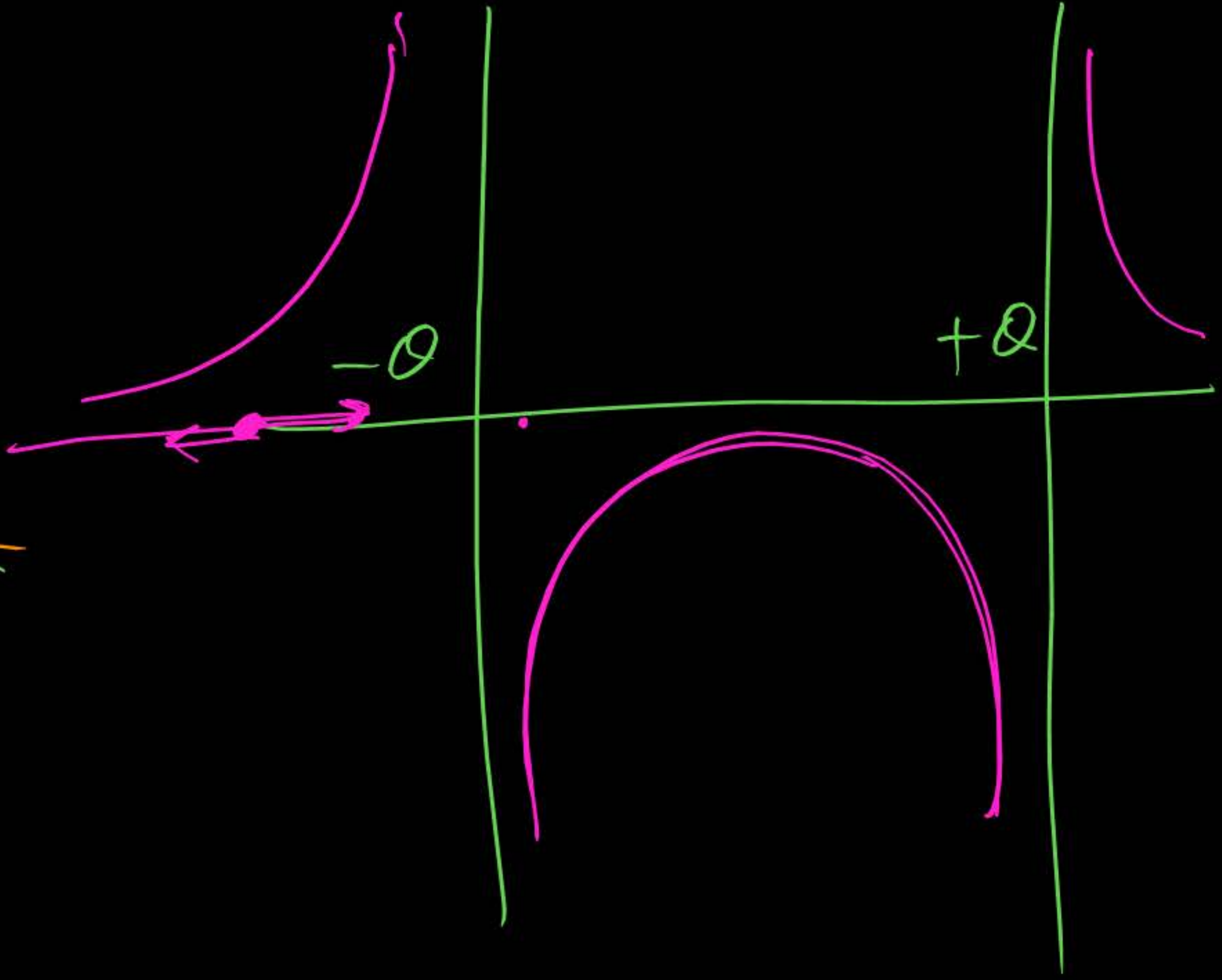


+Q
+Q
E=0



+4Q
+Q
E=0


+E
-Q
E=0
-Q


-Q
+Q

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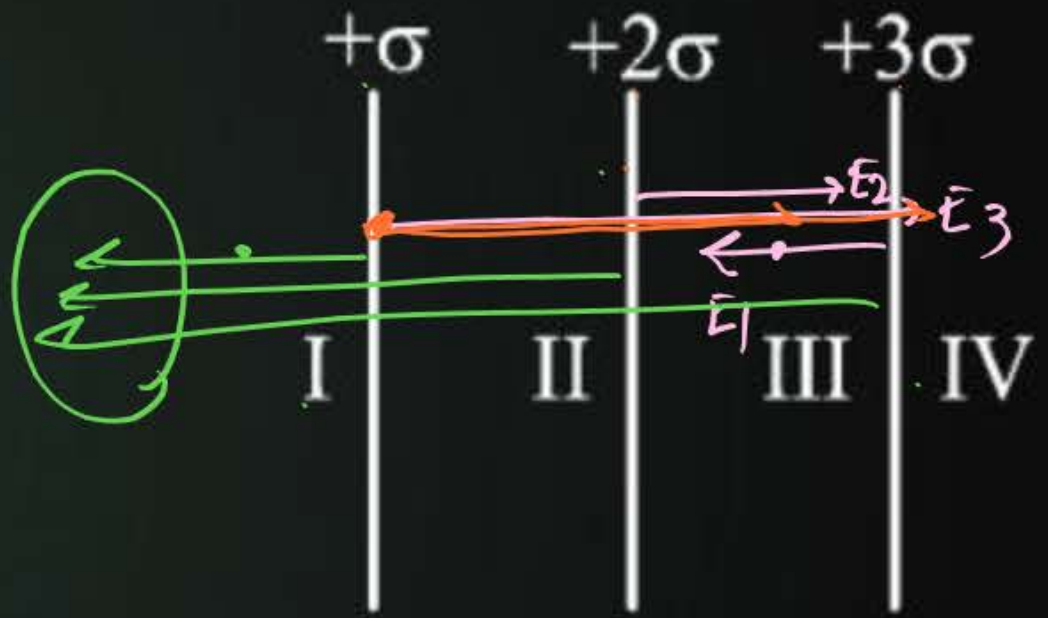
QUESTION

Three large non-conducting plane sheets of charge with charge densities σ, 2σ and 3σ are arranged as shown. The net electric field in region III will be



$\vec{E}_I = ?$

1. $\frac{3\sigma}{\varepsilon_0}$ (towards left)
2. $\frac{2\sigma}{\varepsilon_0}$ (towards left)
3. 0 ✓
4. $\frac{3\sigma}{\varepsilon_0}$ (towards right)

$E_{net} = E_2 + E_3 - E_1$

$= \frac{2\sigma}{2\varepsilon_0} + \frac{\sigma}{2\varepsilon_0} - \frac{3\sigma}{2\varepsilon_0}$

$= \frac{3\sigma - 3\sigma}{2\varepsilon_0} \rightarrow 0$

QUESTION

Non Uniform

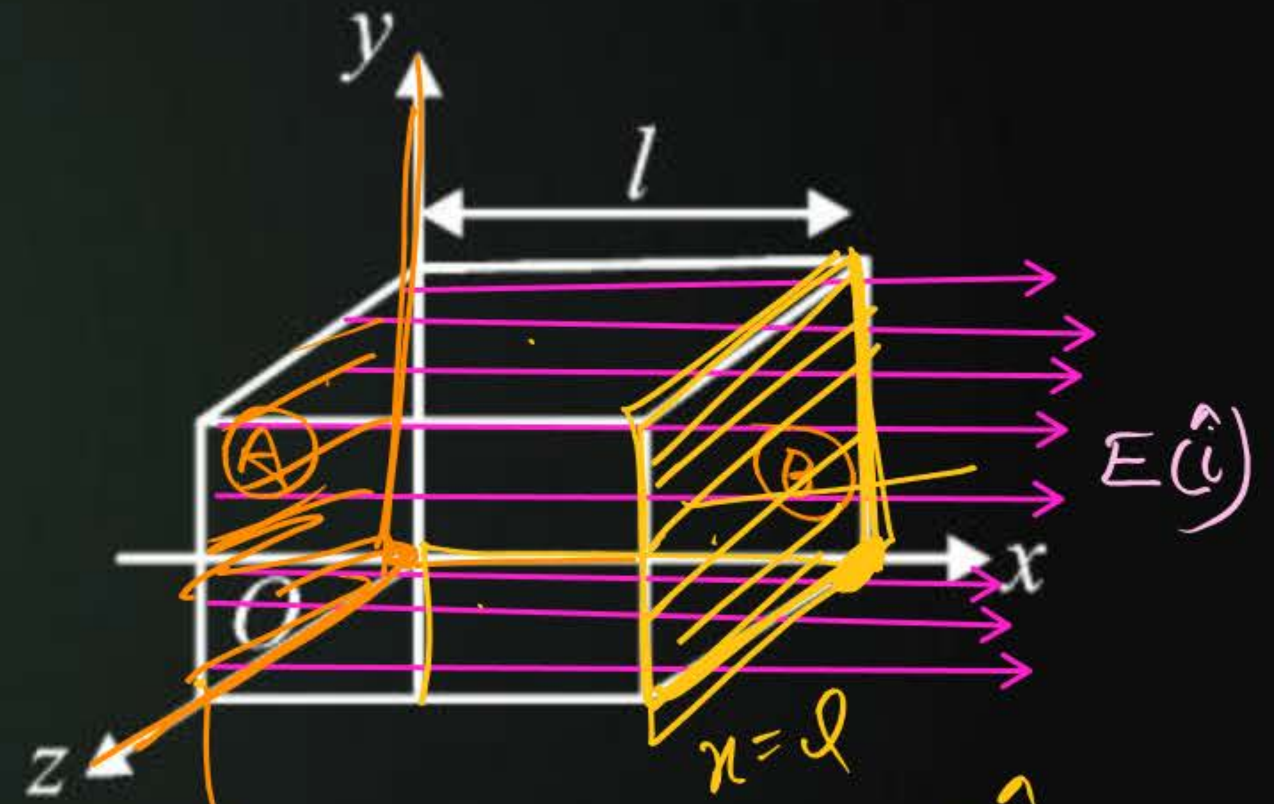
Electric field of a region varies as $\vec{E} = bx\,\hat{\imath}\ \text{NC}^{-1}$. Find the net charge enclosed by the cube as shown in figure.

1. $\dfrac{bl^3}{2\varepsilon_0}$
2. $\dfrac{bl^3}{3\varepsilon_0}$
3. $bl^3\varepsilon_0$ ✓
4. $\dfrac{bl^3\varepsilon_0}{2}$

$$\phi_{\text{close sur}} = \frac{q_{in}}{\varepsilon_0}$$

$$bl^3 = \frac{q_{in}}{\varepsilon_0}$$

$$\boxed{q_{in} = \varepsilon_0 b l^3}$$



$E = 0$ $(0, y_2)$

$E = bl\hat{i} \rightarrow$

$\phi_A = EA = 0$

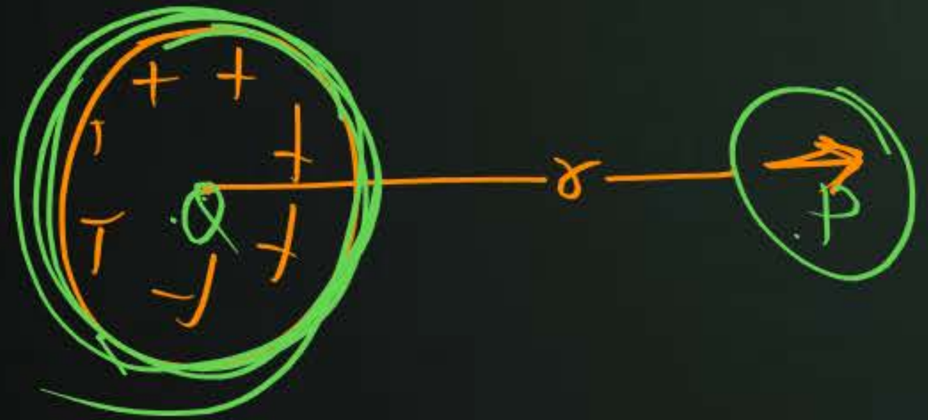
$\phi_B = EA = bl \hat{i} \times l^2 = bl^3$

QUESTION

A short electric dipole is placed along a radial line of a uniformly charged sphere as shown. If the force experienced by dipole at $r = 2R$ and $r = 4R$ and F_1 and F_2 respectively, then F_2/F_1 is

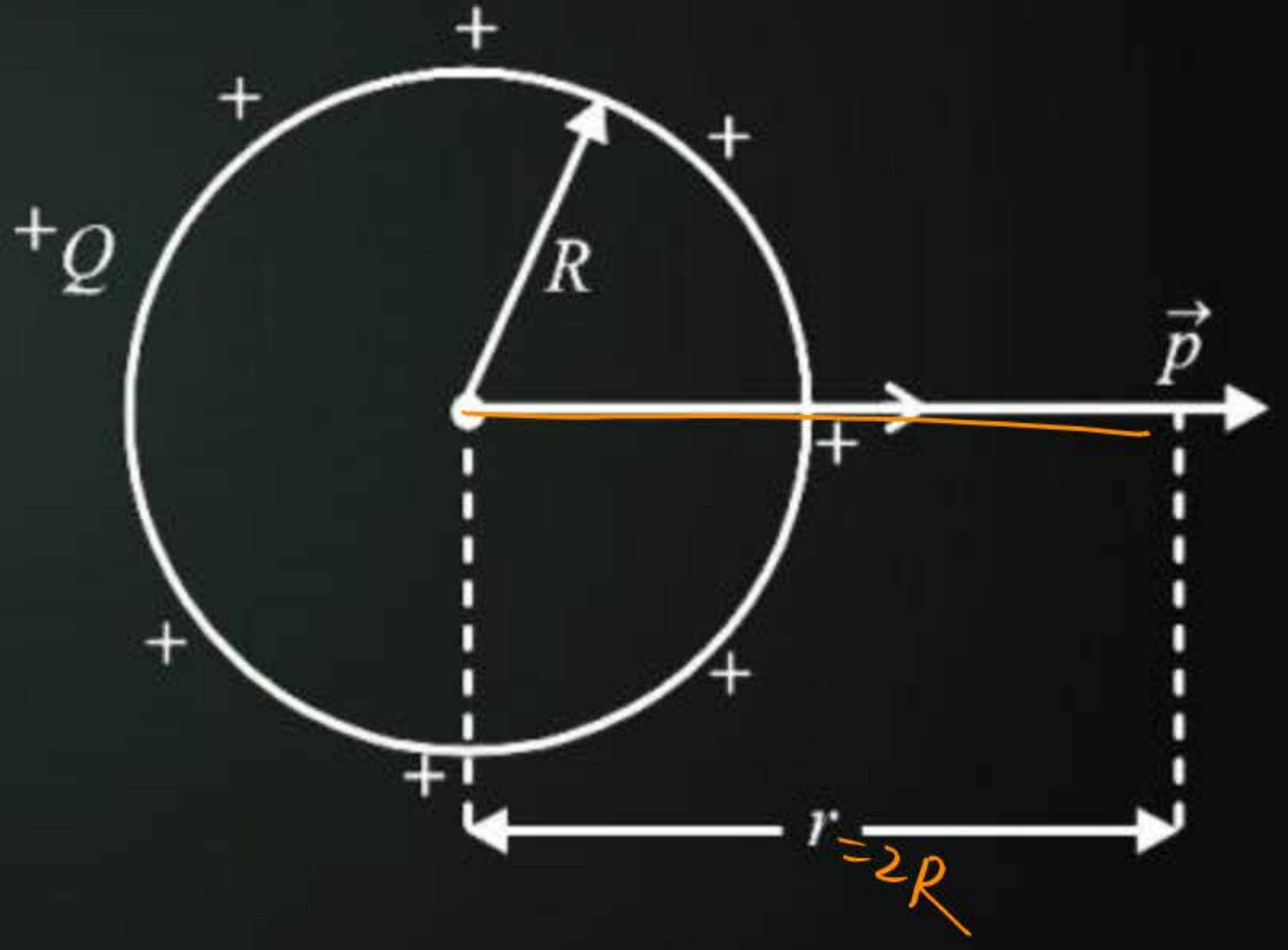
1. 1/8
2. 1/4
3. 1/16
4. 1/32

$F \propto \frac{1}{r^2}$ ✗



$F = qE = Q\frac{2KP}{r^3}$

$\boxed{F \propto \frac{1}{r^3}}$



QUESTION

H/W

An electron moving with the speed 5×10^6 m/s is projected parallel to the electric field of intensity 1×10^3 N/C. Field is responsible for the retardation of motion of electric. Find the distance travelled by the electron before coming to rest for an instant
$(m_e = 9 \times 10^{-31}$ kg, $e = 1.6 \times 10^{-19}$ C)

1. 7 m
2. 0.7 mm
3. 7 cm
4. 0.7 cm

QUESTION

जान लिकू।

A conducting charged spherical shell has a tiny hole cut into its surface. If surface charge density near the hole is σ then electric field in the hole is:-

1. $\frac{\sigma}{\epsilon_0}$, directed inwards
2. $\frac{\sigma}{\epsilon_0}$, directed outwards
3. $\frac{\sigma}{2\epsilon_0}$, directed inwards
4. $\frac{\sigma}{2\epsilon_0}$, directed outwards

QUESTION

If linear density of a wire of length L depends on distance x from one end as $\lambda = \frac{\lambda_0 x}{L}$. Find total charge of wire.

(1) $\lambda_0 L$

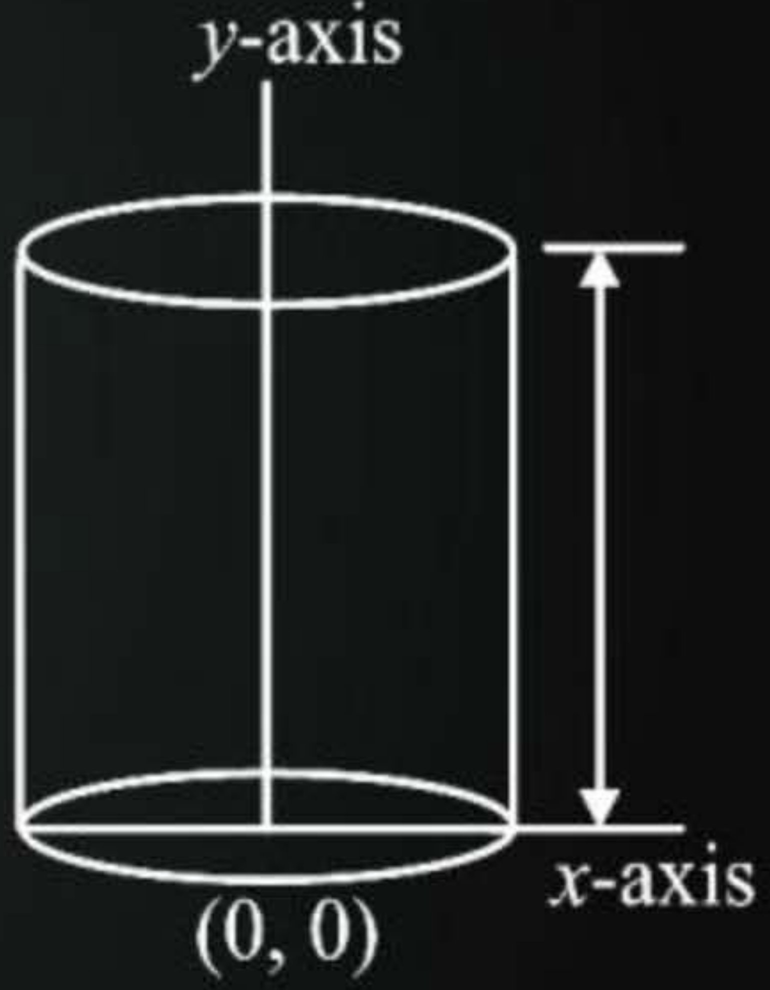
(2) $\frac{\lambda_0 L}{2}$

(3) $\frac{\lambda_0 L}{4}$

(4) $2\lambda_0 L$

QUESTION

A long charged wire is kept on $+y$-axis, with one end at origin. Its linear charge density is given as $\lambda = \lambda_0 y$. Calculate electric flux passing through the cylinder.



1. $\dfrac{\lambda_0 L^2}{\epsilon_0}$

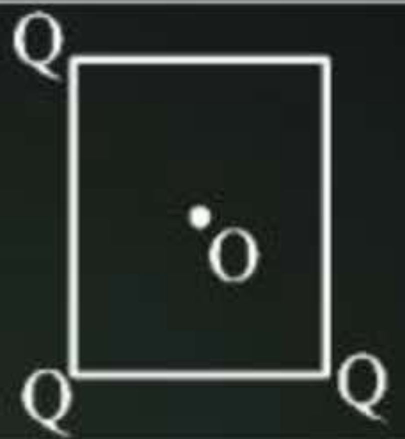
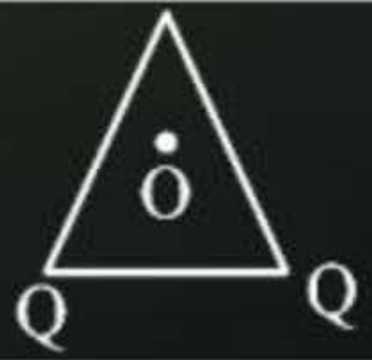
2. $\dfrac{\lambda_0 L^2}{2\epsilon_0}$

3. $\dfrac{2\lambda_0 L^2}{\epsilon_0}$

4. None

QUESTION

Match the column:

List-I		List-II	
(P)		(1)	$\searrow$
(Q)		(2)	$\uparrow$
(R)		(3)	$\nearrow$
(S)		(4)	$\downarrow$

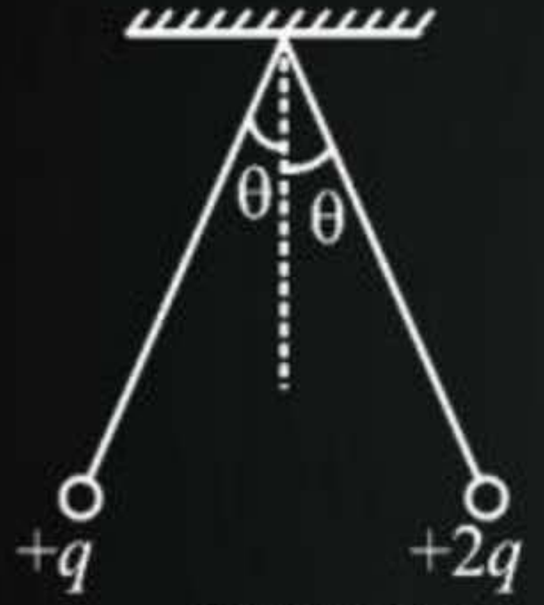
Code:

	P	Q	R	S
1	2	1	4	3
2	3	1	2	4
3	3	2	1	4
4	1	4	3	2

QUESTION

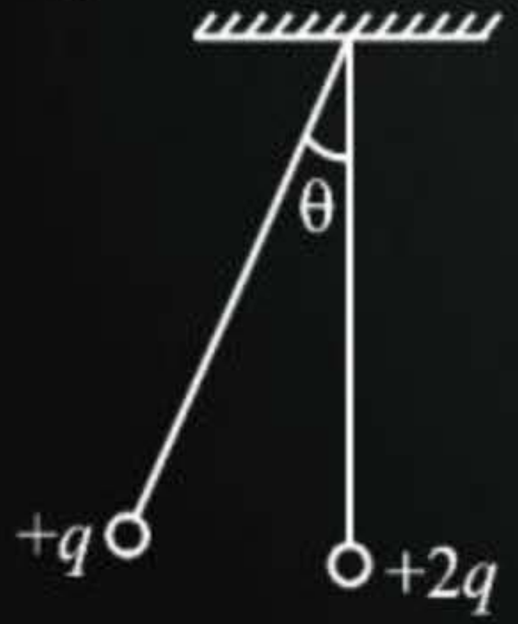
Two metal spheres of same mass are suspended from a common point by a light insulating string. The length of each string is same. The spheres are given electric charges $+q$ on one and $+2q$ on the other. Which of the following diagram best shows the resulting positions of spheres?

(1)

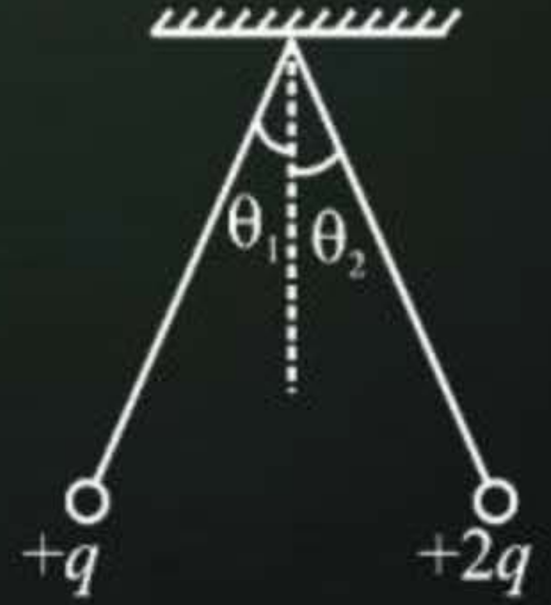


(2)

(3)



(4)



QUESTION

dont do it Irodov

Two identical charged spheres suspended from a common point by two massless strings of length l are initially at a distance $d(d << l)$ apart because of their mutual repulsion. The charge begins to leak from both the spheres at a constant rate. As a result the charge approach each other with a velocity v. Then as a function of distance x between them. [NEET-2016]

1. $v \propto x^{-1}$
2. $v \propto x^{\frac{1}{2}}$
3. $v \propto x$
4. $v \propto x^{-\frac{1}{2}}$

QUESTION

A charged particle q of mass m is in equilibrium at a height h from a horizontal infinite line charge wit uniform linear charge density λ. The charge lies in the vertical plane containing the line charge. If the particle is displaced slightly (vertically) prove that the motion of the charged particle will be simple harmonic. Also find its time period.

QUESTION

Two point charges 2 μC and 8 μC are placed at position $x = 0$ and $x = 4$ m respectively. The distance of the neutral point form the smaller charge is found to be at $x = \alpha/\beta$. Find the value of $(\alpha + \beta)$.

1. 7
2. 5
3. 4
4. 3

QUESTION

Statement-I: In a given situation of arrangement of charges, an extra charge is placed outside the Gaussion surface. In the Gauss Theorem

$$\oint \vec{E} \cdot d\vec{s} = \frac{Q_{\text{in}}}{\epsilon_0}$$

Q_{in} remains unchanged where $\vec{E}$ as electric field at the site of the element is changed.

Statement-II: Electric field E at any point on the Gaussian surface is due to inside charge only.

1. Statement-I is true, statement-II is true and statement-II is correct explanation for statement-I.
2. Statement-I is true, statement-II is true and statement-II is NOT the correct explanation for statement-I.
3. Statement-I is true, statement-II is false.
4. Statement-I is false, statement-II is true.

QUESTION

Statement-I: Coulombic force follows the principle of superposition.

and

Statement-II: Coulombic force is directly proportional to the charges on both particle.

1. Statement-I is true, statement-II is true and statement-II is correct explanation for statement-I.
2. Statement-I is true, statement-II is true and statement-II is NOT the correct explanation for statement-I.
3. Statement-I is true, statement-II is false.
4. Statement-I is false, statement-II is true.

QUESTION

Assertion (A): If a positive point charge is brought near an isolated neutral metal cube, the cube becomes negatively charged.

Reason (R): If a positive point charge is brought near an isolated neutral metal cube, the cube remains neutral.

1. Both (A) and (R) are true and (R) is the correct explanation of (A).
2. Both (A) and (R) are true and (R) is NOT the correct explanation of (A).
3. (A) is true but (R) is false.
4. (A) is false but (R) is true.

QUESTION

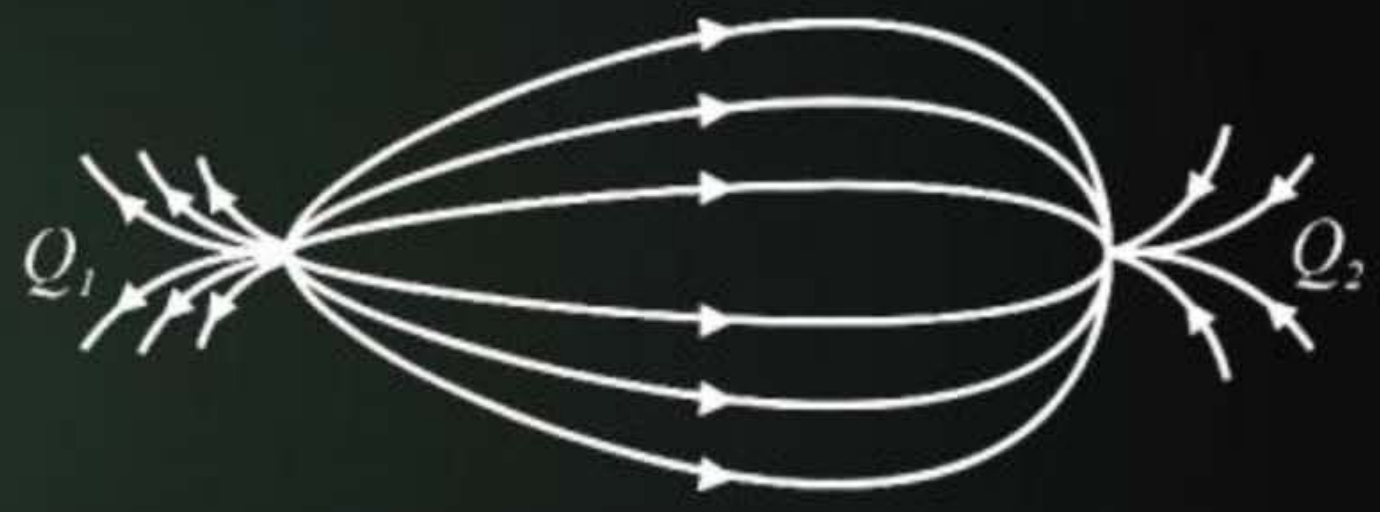
Assertion (A): If a charge is released from rest in an electric field, it will always start to move along an electric field line.

Reason (R): Force on a charged particle is always in the direction of electric field.

1. Both (A) and (R) are true and (R) is the correct explanation of (A).
2. Both (A) and (R) are true and (R) is NOT the correct explanation of (A).
3. (A) is true but (R) is false.
4. (A) is false but (R) is true.

QUESTION

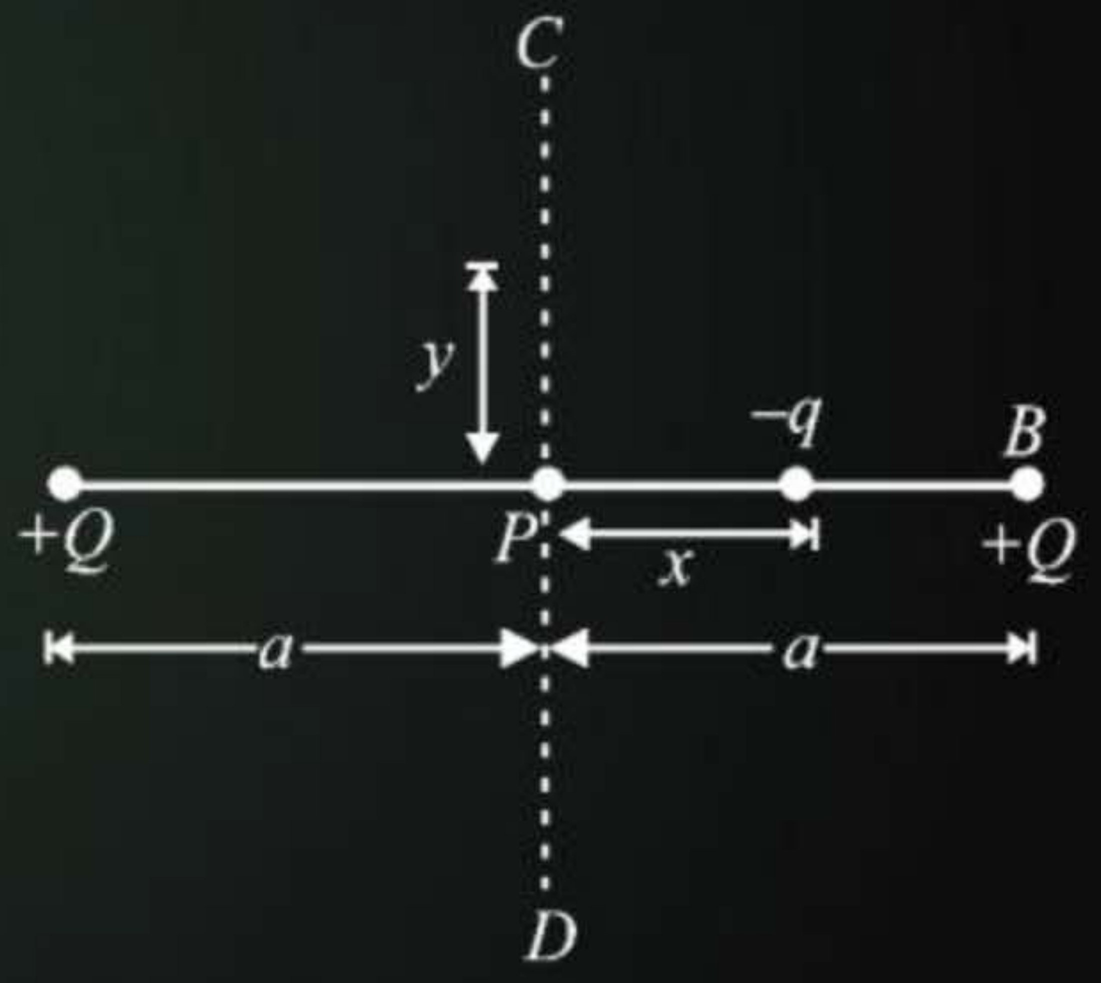
A few electric field lines for a system of two charges Q_1 and Q_2 fixed at two different points on their axis are shown in the figure. With the figure what information about charges and electric field is incorrect.



1. $|Q_1| > |Q_2|$
2. $Q_1 \rightarrow +ve, Q_2 \rightarrow -ve$
3. At a finite distance to the left of Q_1 the electric field is zero
4. At a finite distance to the right of Q_2 the electric field is zero

QUESTION

For the arrangement shown in the Fig., the two positive charges, $+Q$ each, are fixed. Mark out the correct statement regarding a third charged particle $-q$ placed at mid point P that can be displaced along or perpendicular to the line connecting the charges,



1. The particle will perform SHM for $x << a$.
2. The particle will undergo oscillatory motion but not SHM about P for x comparable to a.
3. The particle will perform SHM for $y << a$.
4. The particle will undergo oscillatory motion but not SHM about P for $y << a$.

QUESTION

Match Column-I with Column-II

	Column-I		Column-II
I.	Electric field due to infinite plane sheet of charge	a.	0
II.	Electric field due to infinite conducting plane sheet of uniform thickness	b.	$\frac{\sigma}{2\varepsilon_0}$
III.	Electric field due to Non-conducting charged solid sphere at its surface	c.	$\frac{R\rho}{3\varepsilon_0}$
IV.	Electric field due to Non-conducting charged solid sphere at its centre	d.	$\frac{\rho}{\varepsilon_0}$

1. I-c, II-d, III-a, IV-b
2. I-b, II-d, III-c, IV-a
3. I-b, II-d, III-a, IV-c
4. I-b, II-a, III-d, IV-c

QUESTION

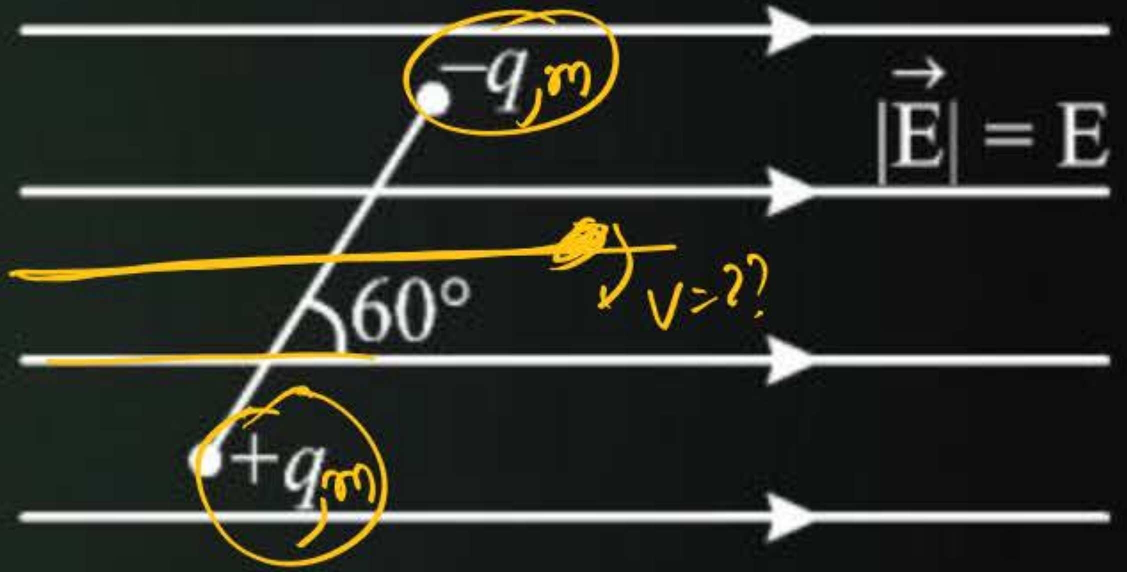
Two charges $(-q, m)$ and $(+q, m)$ are connected by a massless rod of length l and released in a region of uniform electric field as shown. Find the maximum speed of the charges:

(1) $\sqrt{\dfrac{qE\ell}{2m}}$

(2) $\sqrt{\dfrac{3qE\ell}{2m}}$

(3) $\sqrt{\dfrac{3qE\ell}{m}}$

(4) $\sqrt{\dfrac{qE\ell}{3m}}$



$\boxed{\text{C.O.M.E}}$

find ω

$v = r\omega$

THANK
YOU